

Additional Avian Records from the Miocene of Kern County, California with the Description of a New Species of Fulmar (Aves: Procellariidae)

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Abstract.—Additional avian records from the Miocene of Kern County, California with the description of a new species of fulmar (Aves:Procellariidae) by Hildegarde Howard. *Bull. Southern California Acad. Sci.*, 83(2):84-89, 1984. Previously unrecorded avian taxa from the middle Miocene Sharktooth Hill Bonebed in Kern County, California are listed: *Fulmarus* n. sp., *Osteodontornis* ?orri, Ciconiidae gen. and sp. to be determined, and *Megapaloelodus* sp. *Fulmarus miocaenus* n. sp. is described from a humerus representing a smaller species than *F. hammeri*, the only other Tertiary fulmar recorded from California. It is also smaller than humeri of Recent species of fulmars and is further distinguished therefrom by a better developed bicipital area and more distally placed ectepicondylar prominence.

The middle Miocene marine deposits of the Sharktooth Hill Bonebed in Kern County, California, were discussed in detail by Mitchell (1965). His listing of the fauna recovered from these beds (sharks, bony fishes, reptiles, birds, and mammals) included the following birds:

Albatross—*Diomedea californica* Miller 1962.

Shearwaters—*Puffinus inceptor* Wetmore 1930, *P. priscus* Miller 1961, *P. mitchelli* Miller 1961.

Gannets—*Morus vagabundus* Wetmore 1930, *Morus* sp. (Miller 1961).

Waterbirds—*Presbychen abavus* Wetmore 1930, *Branta* sp. (Miller 1961).

Shorebirds—*Recurvirostra* sp. (Miller 1961).

As collecting continued in the years following Mitchell's report, a second albatross, *Diomedea milleri* Howard 1966, and an osprey, *Pandion homalopteron* Warter 1976, were added.

The collections at the Natural History Museum of Los Angeles County now contain over 120 unrecorded avian specimens from Sharktooth Hill. Included among these are representatives of four taxa not noted in the above listing:

Order Procellariiformes, Family Procellariidae (Shearwaters et al.).

Genus *Fulmarus*, n. sp. (Fulmar).

Order Pelecaniformes, Family Pseudodontornithidae (Bony-toothed Birds).

Genus *Osteodontornis*, species ?orri Howard 1957.

Order Ciconiiformes, Family Ciconiidae (Storks).

Genus and species to be determined.

Order Charadriiformes, Family Phoenicopteridae (Flamingos).

Genus *Megapaloelodus* A. Miller 1944, species ?

The present paper concerns the description of *Fulmarus* n. sp. The material

representing the other taxa is under study and discussion thereof will be presented at a later date.

Methods and Materials

Acronyms Used

LACM—Natural History Museum of Los Angeles County.

USNM—National Museum of Natural History, Smithsonian Institution.

Comparative Material Available

Fossil: Distal fragment of humerus (LACM 18263) referred to *Fulmarus hammeri*.

Recent: Humeri of *Fulmarus glacialis rodgersi* (7), *F. glacialoides* (2), *Thalassoica antarctica* (1), *Daption capense* (2), *Pagodroma nivea* (1), *Pterodroma phaeopygia* (1), *P. lessoni* (1), *Halobaena caerulea* (2), *Pachyptila vittata* (2), *Puffinus creatopus* (2), *P. griseus* (2), *P. opisthomelas* (11), *P. pacificus* (1). All specimens of *Fulmarus glacialis*, one each of *F. glacialoides*, *Daption capense*, *Halobaena caerulea*, *Pterodroma lessoni*, *Pachyptila vittata*, and all of the several species of *Puffinus* are from the LACM collections; the other Recent material was loaned by USNM.

Description

Among the avian fossils collected from Sharktooth Hill in 1979 was a small, fragmented humerus (LACM 122995) bearing similarities to those of the family Procellariidae (see Fig. 1). This family, which includes the fulmars, petrels and shearwaters, is represented at Sharktooth Hill by more than 30 bones of the shearwaters, genus *Puffinus*. After expert preparation of the fragile LACM 122995 humerus, it became evident that the specimen represented a species more closely allied to the fulmars than to the shearwaters.

Although the living *Fulmarus glacialis* is recorded from the Pleistocene of California and Norway (Brodkorb 1963, p. 245), there are only two Tertiary records of the genus. Both are of Miocene age. Only one of these was described, *F. hammeri* Howard 1968 from Orange County, California, with holotype carpometa-carpus and referred distal fragment of humerus. The other, a portion of the shaft of a humerus, from Maryland, was recorded as *Fulmarus* sp. (Wetmore 1926). Both represent species of larger size than that represented by the specimen from Sharktooth Hill.

Generic Analysis

Humerus LACM 122995 is distinguished from this element in the shearwaters (genus *Puffinus*) by the deltoid crest having a prominently projecting, hooklike point, the bicipital crest longer and clearly delimited distally, the ectepicondylar prominence short and blunt, the entepicondyle more rounded and less blade-like in its proximal extension anconally, and the shaft above the brachial depression broad laterally and shallow in its palmar-anconal dimension.

In these characters resemblance is closest to the humerus of the fulmars, *Fulmarus glacialis* and *F. glacialoides*, and the petrels, *Thalassoica antarctica* and *Daption capense*. The humeri of *Thalassoica* and *Daption*, however, are relatively



Fig. 1. Holotype humerus (LACM 122995) of *Fulmarus miocaenus* n. sp. Left, anconal view; right, palmar view. Greatest length = 78.3 mm.

broader proximally and have a marked depression on the anconal surface of the shaft immediately below the head, a depression which is not present in the two Recent species of *Fulmarus* or in the fossil at hand. Also, in *Daption*, the point of the deltoid crest is less sharply hooked.

The prominently projecting deltoid crest, with its hooklike point, is also present in members of the genus *Pterodroma*. The two species of this genus available for comparison (*P. phaeopygia* and *P. lessoni*), however, resemble the shearwaters in the long, pointed ectepicondylar prominence and blade-like proximal anconal extension of the entepicondyle. Other petrels, such as *Pagodroma nivea*, *Halobaena caerulea*, and *Pachyptila vittata*, lack the hooklike quality of the deltoid crest, although it is more pointed in these species than in the shearwaters. The *Pagodroma* humerus is further distinguished from the fossil by the depression of the shaft below the head. In *Pachyptila vittata* the bicipital crest is short as in *Puffinus*, and in *Halobaena caerulea* the pectoral attachment is longer and narrower than in the fossil humerus, and the ectepicondylar prominence is wider.

Table 1. Measurements (in millimeters) of humeri of *Fulmarus miocaenus* compared with those of Recent species of *Fulmarus*.

	<i>F. miocaenus</i> Holotype	<i>F. glacialis</i> 7 specimens		<i>F. glacialoides</i>	
		Min.	Max.	USNM 491469	LACM 100856
Greatest length	78.3	98.6	106.7	106.9	107.8
Proximal breadth ¹	13.0	16.0	17.0	18.0	18.6
Greatest breadth of distal end	9.5	11.7	12.7	12.7	12.9
Height of ectepicondylar prominence above distal end of humerus	7.8	11.0	11.7	13.0	13.6
Length of deltoid crest, from head	20.4	24.7	27.5	28.2	28.5
Length of bicipital crest, from head	15.2	16.9	18.4	19.7	20.2
Breadth of shaft ²	5.4	6.7	6.8	8.0	8.0
Depth of shaft ²	3.2	3.8	4.0	4.8	4.8

¹ Proximal breadth measured from external tuberosity to below tip of internal tuberosity.

² Breadth and anconal-palmar depth of shaft measured just above brachial impression.

Although the characters of the Sharktooth Hill humerus most closely resemble those found in *Fulmarus*, the differences noted between it and the Recent species of the genus are more marked than those that distinguish the latter from each other. In view of the similarities noted between the humeri of *Thalassoica* and *Daption* and those of *Fulmarus*, it is possible that a distinct, perhaps ancestral, genus is represented by this Miocene bone. With the limited knowledge at hand, however, it is considered advisable to record this single specimen as a new species within the genus *Fulmarus*.

Fulmarus miocaenus n. sp.

Holotype.—Nearly complete left humerus, Natural History Museum of Los Angeles County no. 122995; collected by Howell W. Thomas in 1979.

Locality.—LACM locality 3162, Sharktooth Hill Bonebed, Kern County, California.

Formation and age.—Round Mountain Silt, middle Miocene, Barstovian Land Mammal Age.

Diagnosis.—Distinguished from the humeri of *Fulmarus glacialis* and *F. glacialoides* by small size (Table 1) and the following morphological characters: shaft anconally below head less acutely angular, with capital shaft ridge more median in position and less proximal in extent; bicipital crest relatively longer with internal and distal contours more evenly rounded and distal termination more clearly marked; bicipital surface more swollen viewed from palmar side; ectepicondylar prominence less raised above distal end of humerus (ratio of height of prominence above distal end of humerus to breadth of distal end, 82 percent, as compared to 92–95 percent in *F. glacialis* and 102 percent in *F. glacialoides*). Distinguished from humerus of Miocene species *F. hammeri* by smaller size (distance from distal end of humerus to base of ectepicondylar prominence 7.8 mm, depth of

external condyle 5.8 mm; same measurements in the humerus of *F. hammeri* 13.0 mm and 9.1 mm respectively).

Measurements compared with living species of *Fulmarus*: Table 1.

Discussion.—The Maryland record of *Fulmarus* sp. (Wetmore 1926) is based on a fragment of the shaft of a humerus (USNM 237160) between the nutrient foramen and the lower half of the deltoid crest. It was placed in the genus *Fulmarus* on the basis of the high elevation of the nutrient foramen and general similarity and size with respect to the humerus of *F. glacialis*. Size alone precludes referral to *F. miocaenus*: breadth of shaft immediately below the deltoid crest in *F. miocaenus* 5.0 mm, depth of shaft at the same place 4.0 mm; the same measurements on USNM 237160, according to Storrs Olson of USNM, who examined the fragment for me, are 5.8 mm and 4.7 mm respectively—close to the minimum of the *F. glacialis* humeri at hand (5.7 mm breadth, 4.7 mm depth). Furthermore, Olson notes that the specimen preserves no diagnostic features that could be used in comparison with the holotype of *F. miocaenus*, and should probably now be classified only as “Procellariidae, gen. and sp. indet.”

Conclusion

Fulmarus miocaenus n. sp. is the ninth species to be described from the Sharktooth Hill Bonebed, and the fourth species of the family Procellariidae named from this middle Miocene site. The other members of the family are the shearwaters *Puffinus inceptor*, *P. mitchelli*, and *P. priscus*. Although the shearwaters are well represented in the Tertiary fossil record, *Fulmarus miocaenus* is only the second species of fulmar to be described, and only the third fulmarine record for the Tertiary. In addition to *P. hammeri* described from the Miocene of Orange County, California, *Fulmarus* sp. was recorded from the Miocene of Maryland. Based on a fragment of humeral shaft, the generic assignment of the Maryland specimen is now questioned.

Whether the species represented by the additional families herein recorded from the Bonebed—Pseudodontornithidae, Ciconiidae and Phoenicopteridae—are assignable to species previously described from other fossil sites, or represent species new to science is yet to be determined.

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